US009232127B2

(12) **United States Patent**
Alkouby

(10) **Patent No.: US 9,232,127 B2**
(45) **Date of Patent: Jan. 5, 2016**

(54) **LOUPE ACCESSORY AND VIEWING METHOD**

(71) Applicant: **Moshe Lior Alkouby**, London (GB)

(72) Inventor: **Moshe Lior Alkouby**, London (GB)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 339 days.

(21) Appl. No.: **13/872,142**

(22) Filed: **Apr. 28, 2013**

(65) **Prior Publication Data**

US 2014/0320625 A1 Oct. 30, 2014

(51) **Int. Cl.**

G01N 21/00	(2006.01)
H04N 5/232	(2006.01)
G02B 25/00	(2006.01)
H04N 5/225	(2006.01)

(52) **U.S. Cl.**

CPC ***H04N 5/232*** (2013.01); ***G02B 25/007*** (2013.01); ***H04N 5/2254*** (2013.01)

(58) **Field of Classification Search**

CPC G01N 21/64; G01N 21/65; G01N 21/87; G01N 21/8806; G01N 33/381

USPC 356/30, 72–73, 300–445

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,734,500 A * 3/1998 Gebelein 359/419

* cited by examiner

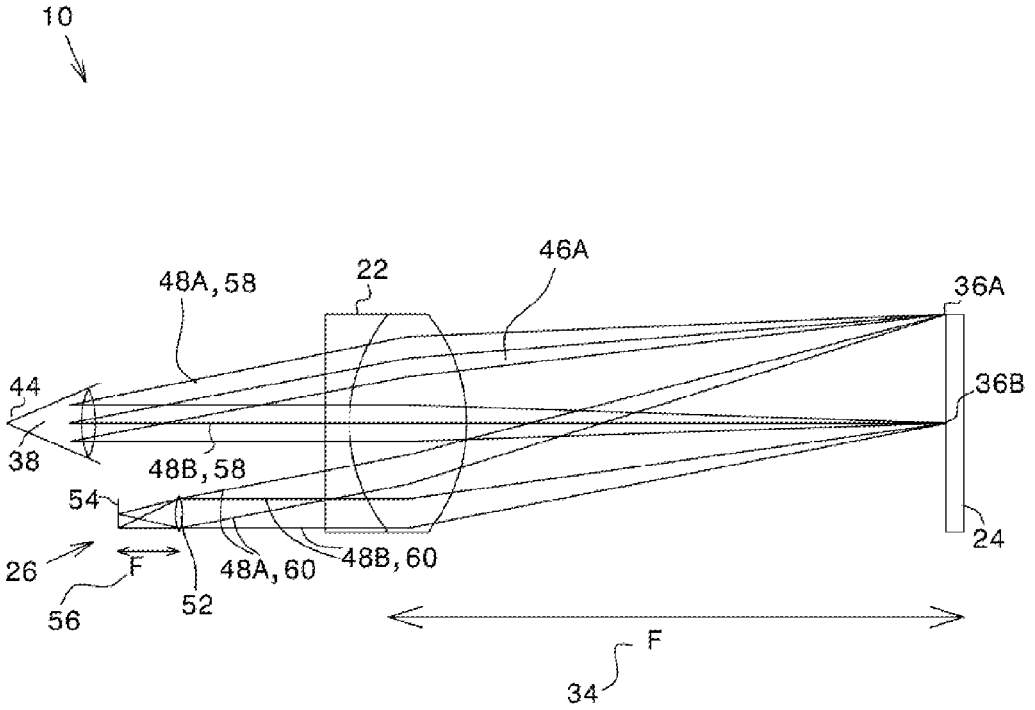
Primary Examiner — Abdullahi Nur

(74) *Attorney, Agent, or Firm* — Graeser Associates International Inc; Dvorah Graeser

(57) **ABSTRACT**

A loupe accessory comprising: a loupe, comprising a first lens characterized in a positive focal length of less than 350 mm, the first lens for producing substantially infinity rays from a relatively close object, and an infinity-focus camera, comprising an image sensor and a second lens disposed at a fixed distance from the image sensor, the fixed distance being a focal length of the second lens, wherein the infinity-focus camera is fixed to the first lens, for imaging the infinity rays on the image sensor, thereby a first portion of the infinity rays produced by the first lens is imaged by the infinity-focus camera, and a second portion of the infinity rays produced by a second portion of the first lens is directly viewed by a human eye.

6 Claims, 5 Drawing Sheets



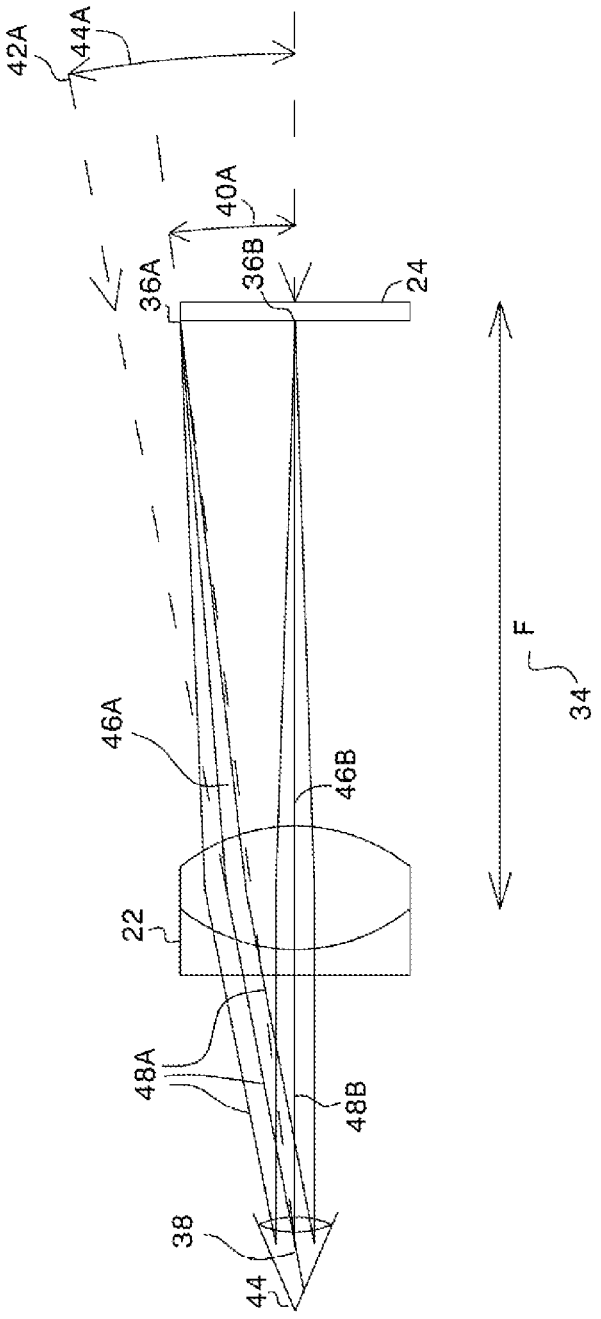


FIG 1 PRIOR ART

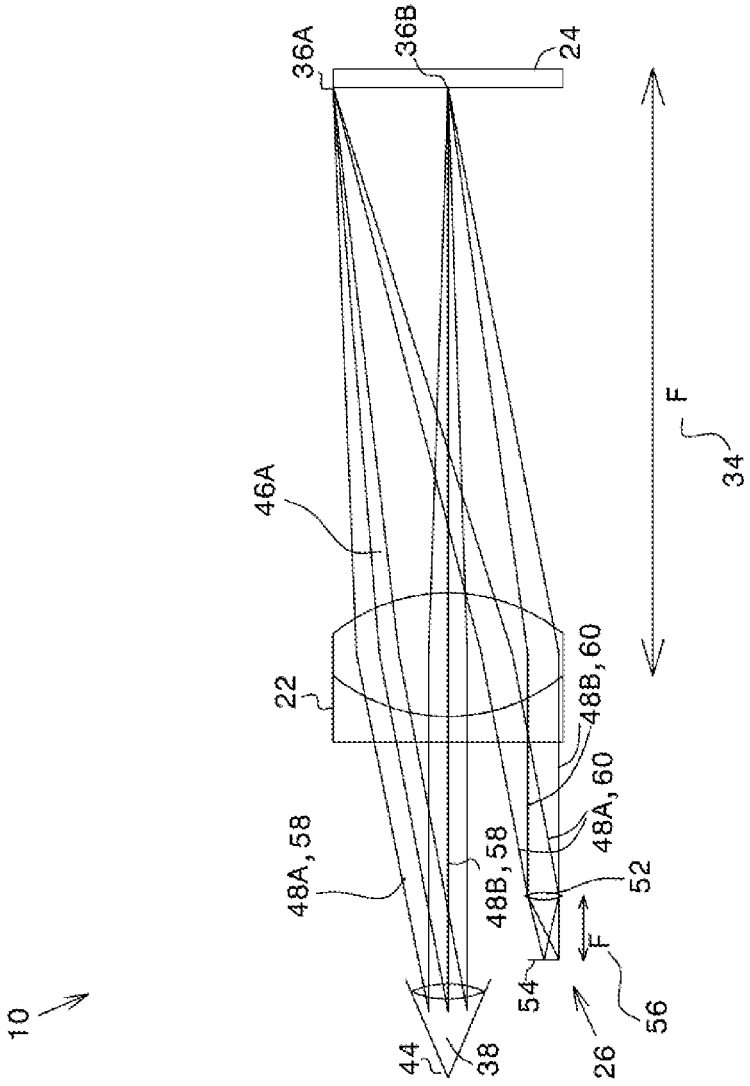

10
36A
36B
24
F
34
46A
22
48B, 60
48A, 60
48A, 58
48B, 58
52
F
54
56
44
38
26

FIG 2

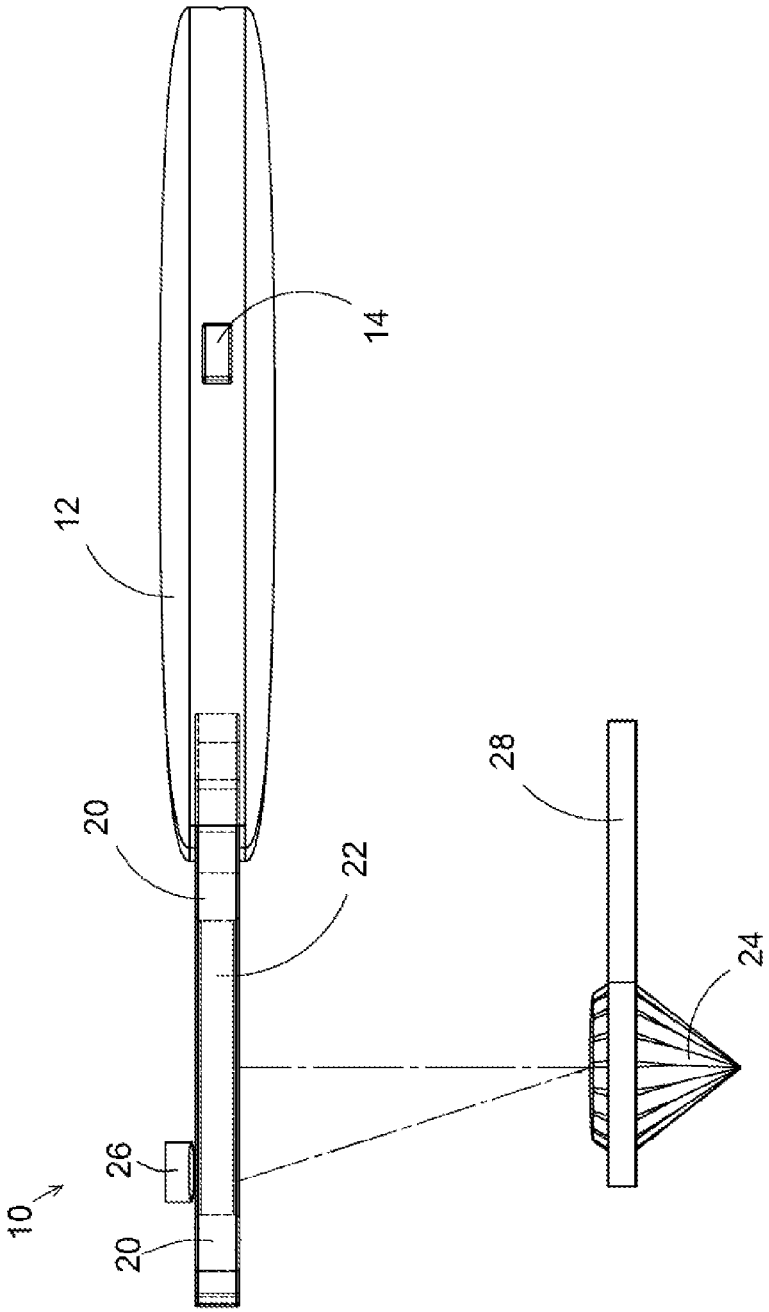


FIG 3

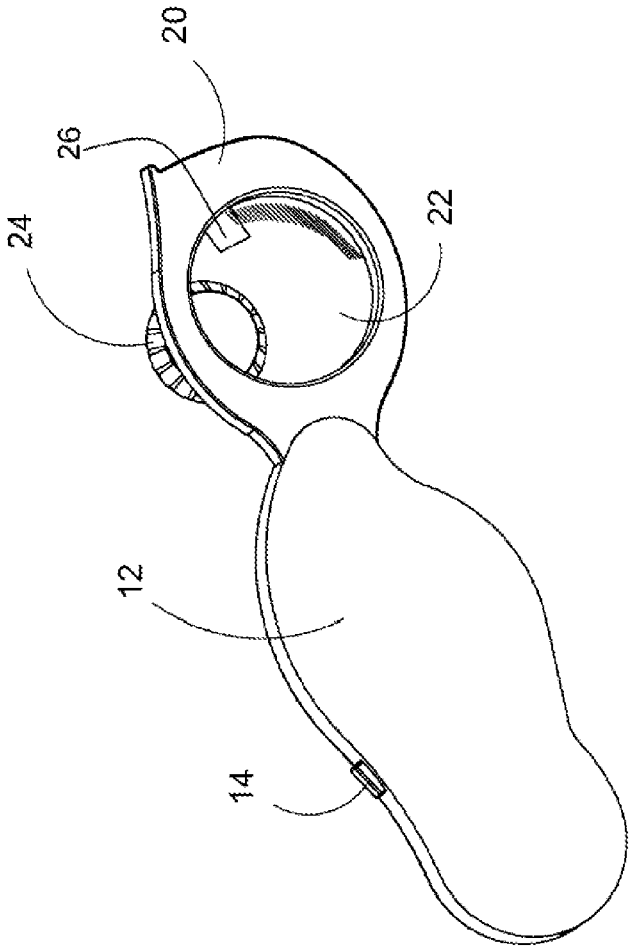


FIG 4

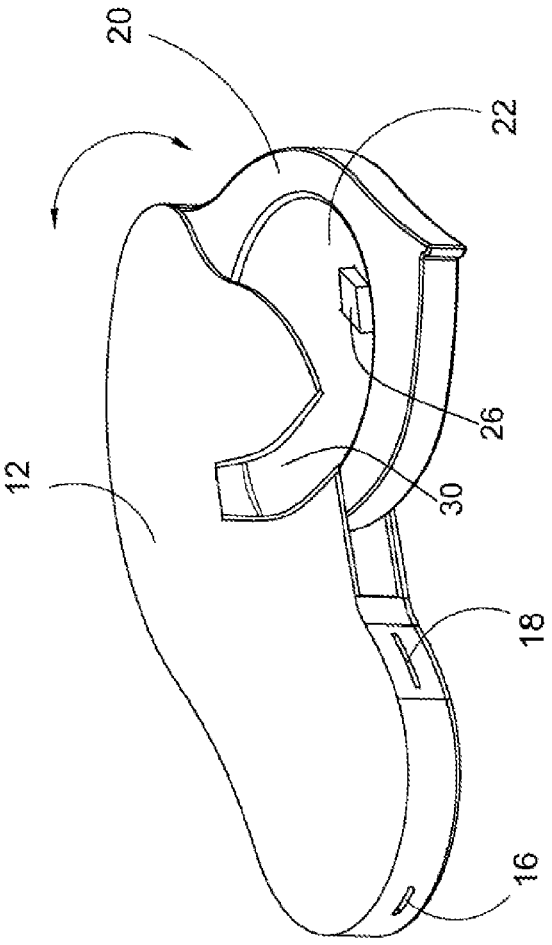


FIG 5

LOUPE ACCESSORY AND VIEWING METHOD

FIELD OF THE INVENTION

The present invention relates to the field of loupes. More particularly, the invention relates to a method and apparatus for combining direct and digital viewing.

BACKGROUND OF THE INVENTION

A loupe or a magnifying lens is a device frequently associated with jewelers, usually taking the form of a simple positive lens. In use, the magnifier is held close to the eye, while the object to be viewed is brought to the focal point of the lens.

A loupe constitutes any positive lens with a focal length of less than 250 mm applied for direct viewing of a close object by the human eye. The approximate magnification M provided by the lens is calculated by dividing its focal length into 250. For example, a 50-mm lens will provide a magnification of M=250/50=5×; a 25-mm lens will provide a magnification of M=250/25=10×.

This formula applies to the typical case where the object is placed at the focal plane of the magnifier lens and the virtual image being viewed appears at infinity. This condition allows comfortable viewing with the relaxed eye.

Especially in jewelry, the basic assumption is that the user believes the direct view by the eye through the loupe, even though digital imaging may provide even greater magnification. The reason is that the user observes the diamond from different angles and with different illuminations thereon.

However, this assumption limits the marketing of jewelry, especially regarding diamonds, in that one expert may travel all over the world to physically show other people the diamond, offering it for sale.

All the methods described above have not yet provided satisfactory solutions to the problem of direct-eye viewing requirement together with information sharing between persons.

It is an object of the present invention to provide a method and apparatus for satisfying the direct-eye viewing requirement, together with information sharing between persons.

It is an object of the present invention to provide a solution to the above-mentioned and other problems of the prior art.

Other objects and advantages of the invention will become apparent as the description proceeds.

SUMMARY OF THE INVENTION

In one aspect, the present invention is directed to a loupe accessory (**10**) comprising:

a loupe, comprising a first lens (**22**) characterized in a positive focal length of less than 350 mm, the first lens (**22**) for producing substantially infinity rays (**48**A) from a relatively close object (**24**); and

an infinity-focus camera (**26**), comprising an image sensor (**54**) and a second lens (**52**) disposed at a fixed distance from the image sensor (**54**), the fixed distance being a focal length (**56**) of the second lens (**52**),

wherein the infinity-focus camera (**26**) is fixed to the first lens (**22**) at the side of the eye, occupying a relatively small portion of the first lens (**22**), for imaging the infinity rays (**48**A) on the image sensor (**54**),

thereby a first portion of the infinity rays (**48**A) produced by the first lens (**22**) is imaged by the infinity-focus camera (**26**), and

a second portion of the infinity rays (**48**A) produced by a second portion of the first lens (**22**) is directly viewed by a human eye (**38**),

thereby the infinity-focus camera (**26**) captures the direct view of the human eye (**38**).

The loupe accessory (**10**) may further comprise:

a button (**14**) for manually operating the infinity-focus camera (**26**), for photographing the object (**24**) upon the direct viewing by the human eye (**38**).

The loupe accessory (**10**) may further comprise:

at least one port (**16**), for transferring the photographing from the infinity-focus camera (**26**),

thereby substantially allowing showing the direct view of the human eye (**38**) to another person.

The loupe may further comprise:

a handle (**12**) comprising a packaging case for the first lens (**22**); and

a pivotal connection of a frame (**20**) of the lens (**22**) to the handle (**12**), thereby the loupe accessory (**10**) is shaped like a prior art loupe.

The infinity-focus camera (**26**) may produce still pictures and/or video.

In another aspect, the present invention is directed to a loupe viewing method, the method comprising the steps of:

producing substantially infinity rays (**48**A) from an object (**24**) by a lens (**22**) of a loupe, the infinity rays (**48**A) for allowing direct viewing thereof by a human eye (**38**); and

imaging the infinity rays (**48**A) on an image sensor (**54**) of an infinity-focus camera (**26**),

thereby the infinity-focus camera (**26**) captures the direct view of the human eye (**38**).

The reference numbers have been used to point out elements in the embodiments described and illustrated herein, in order to facilitate the understanding of the invention. They are meant to be merely illustrative, and not limiting. Also, the foregoing embodiments of the invention have been described and illustrated in conjunction with systems and methods thereof, which are meant to be merely illustrative, and not limiting.

BRIEF DESCRIPTION OF THE DRAWINGS

Embodiments, features, aspects and advantages of the present invention are described herein in conjunction with the following drawings:

FIG. **1** depicts typical rays of a prior art loupe.

FIG. **2** depicts a loupe accessory, according to one embodiment of the present invention.

FIG. **3** is a side view of the loupe accessory of FIG. **2**.

FIG. **4** is a top perspective view of the loupe accessory of FIG. **2**.

FIG. **5** is a perspective view of the loupe accessory of FIG. **2** being folded.

It should be understood that the drawings are not necessarily drawn to scale.

DETAILED DESCRIPTION OF THE INVENTION

The present invention will be understood from the following detailed description of embodiments of the invention, which are meant to be descriptive and not limiting. For the sake of brevity, some well-known features, methods, systems, procedures, components, circuits, and so on, are not described in detail.

FIG. **1** depicts typical rays of a prior art loupe.

A prior art loupe **22** constitutes a convex lens. The typical distance of the viewed object **24** from loupe **22** is the focal

length **34** of loupe **22**. Thus, loupe **22** directs all the rays **46**A emanating from point **36**A of object **24** to be parallel one to the other, being rays **48**A; and loupe **22** directs all the rays **46**B emanating from point **36**B of object **24** to be parallel one to the other, being rays **48**B.

Parallel rays **48**A and **48**B emanating towards eye **38** provide relaxed focusing of the eye to the retina **44**.

Thus, eye **38** imagines that rays **46**A emanating from point **36**A coming from an angle **40**A, emanate from an infinite object **42**A having an angle **44**A.

The term "infinity rays" refers herein to parallel rays **48**A and **48**B, since they resemble rays emanating from a very distant object.

Thus, the magnification that lens **22** provides is angle **44**A divided by angle **40**A.

FIG. **2** depicts a loupe accessory, according to one embodiment of the present invention.

In optics and photography, infinity focus is the state wherein a lens forms an image of an object disposed at an infinite distance away from the lens. The infinity is an approximation that even though an object is not in fact disposed at infinity, since the rays emanating therefrom are approximately parallel, only the angle from each point of the object influences the image.

The image for infinity focus is formed at the focal point of the lens, and does not require focusing. The infinity focus approximation is applied in known cameras, having a non-adjustable lens and a fixed distance from the lens to the image sensor. The fixed distance is fixed to the focal length of the camera.

The term "infinity-focus camera" refers herein to a camera having a fixed distance from the lens to the image sensor thereof, the distance being approximately the focal length of the lens.

A loupe accessory **10** includes an infinity-focus camera **26**, and loupe **22**, for producing infinite (parallel) rays **48**A and **48**B to the eye **38** and also to infinity-focus camera **26**. A first portion **58** of infinite rays **48**A and **48**B emanate towards eye **38**, and a second portion **60** of infinite rays **48**A and **48**B emanate towards infinity-focus camera **26**, and are imaged thereby.

Infinity-focus camera **26** includes a lens **52** disposed at a fixed distance from the image sensor thereof **54**, the distance being the focal length **56** of lens **52**.

Thus, infinity-focus camera **26** occupies a portion of the area of loupe **22**, and thus the area of infinity-focus camera **26** must be relatively small in relation to the area of loupe **22**, for allowing eye **38** to comfortably view object **24**.

Camera **26** need not include a display, since the loupe accessory is intended for photographing human aspects viewed by eye **38** directly through loupe **22**. Thus, camera **26** must be designed and fixed such that the photograph provides a picture or video identical to the view of eye **38** directly through loupe **22**.

Since loupe **22** produces parallel rays **48**A and **48**B in fact, not in approximation, infinity-focus camera **26** requiring parallel rays, is suited for imaging the rays, without further adjustment based on viewing a display.

FIG. **3** is a side view of the loupe accessory of FIG. **2**.

FIG. **4** is a top perspective view of the loupe accessory of FIG. **2**.

A diamond **24** held by tweezers **28** is viewed through lens **22**, both by the eye (not shown) and by camera **26** occupying a portion of lens **22**.

Loupe accessory **10** includes lens **22** surrounded by a frame **20**, pivotally connected to a handle **12**. Handle **12** includes a button **14** for operating the photographing. For example, a short press captures a still picture, and a long press on button **14** captures a video.

FIG. **5** is a perspective view of the loupe accessory of FIG. **2** being folded.

Camera **26** is intended for storing the direct view of the eye. Thus, camera **26** includes a memory (not shown), and means for transferring the information thereof. The means may include a port **16**, such as a USB (universal serial bus) port, and a slit **18** for inserting a memory card.

Loupe accessory **10** is shaped like a prior art loupe and may be folded similarly. For example, a depression **30** within handle **12** encasing lens **22**, may allow sliding camera **26** therewithin, for folding lens **22** within handle **12**.

In the figures and/or description herein, the following reference numerals (Reference Signs List) have been mentioned:

numeral **10** denotes a loupe accessory according to one embodiment of the present invention;

numeral **12** denotes a handle, for holding and encasing the lens of the loupe;

numeral **14** denotes a button for capturing;

numeral **16** denotes a port such as a USB;

numeral **18** denotes a slit for a memory card;

numeral **20** denotes the frame of the lens;

numeral **22** denotes the lens, being the main component of the loupe;

numeral **24** denotes the object to be viewed, such as a diamond;

numeral **26** denotes a camera; the camera being of an infinity focus type;

numeral **28** denote tweezers;

numeral **30** denotes a depression, for allowing folding the lens within the handle;

numeral **34** denotes the focal length of the lens of the loupe;

numerals **36**A and **36**B denote points of the object to be viewed;

numeral **40**A denotes the angle from the point of the object to the eye;

numeral **42**A denotes an imaginary infinite object;

numeral **44**A denotes the angle of the imaginary infinite object;

numerals **46**A and **46**B each denote a plurality of rays emanating from points of the objects;

numerals **48**A and **48**B each denote a plurality of parallel rays produced by the lens of the loupe;

numeral **52** denotes a lens of the camera;

numeral **54** denotes an image sensor, such as a CCD array, of the camera;

numeral **56** denotes the focal length of the lens of the camera;

numeral **58** denotes the portion of parallel rays produced by the lens of the loupe and emanating towards the eye; and

numeral **60** denotes the portion of parallel rays produced by the lens of the loupe and emanating towards the camera.

The foregoing description and illustrations of the embodiments of the invention has been presented for the purposes of illustration. It is not intended to be exhaustive or to limit the invention to the above description in any form.

Any term that has been defined above and used in the claims, should to be interpreted according to this definition.

The reference numbers in the claims are not a part of the claims, but rather used for facilitating the reading thereof. These reference numbers should not be interpreted as limiting the claims in any form.

What is claimed is:

1. A loupe accessory comprising:

a loupe, comprising a first lens characterized in a positive focal length of less than 350 mm, said first lens for producing substantially infinity rays from a relatively close object; and

an infinity-focus camera, comprising an image sensor and a second lens disposed at a fixed distance from said image sensor, said fixed distance being a focal length of said second lens,

wherein said infinity-focus camera is fixed to said first lens at the side of the eye, occupying a relatively small portion of said first lens, for imaging said infinity rays on said image sensor,

thereby a first portion of said infinity rays produced by said first lens is imaged by said infinity-focus camera, and

a second portion of said infinity rays produced by a second portion of said first lens is directly viewed by a human eye,

thereby said infinity-focus camera captures the direct view of the human eye.

2. A loupe accessory according to claim 1, further comprising:

a button for manually operating said infinity-focus camera, for photographing said object upon the direct viewing by the human eye.

3. A loupe accessory according to claim 1, further comprising:

at least one port, for transferring said photographing from said infinity-focus camera,

thereby substantially allowing showing the direct view of the human eye to another person.

4. A loupe accessory according to claim 1, wherein said loupe further comprises:

a handle comprising a packaging case for said first lens; and

a pivotal connection of a frame of said lens to said handle, thereby said loupe accessory is shaped like a prior art loupe.

5. A loupe accessory according to claim 1, wherein said infinity-focus camera produces a member selected from a group including: still pictures, video.

6. A loupe viewing method, said method comprising the steps of:

producing substantially infinity rays from an object by a lens of a loupe, said infinity rays for allowing direct viewing thereof by a human eye; and

imaging said infinity rays on an image sensor of an infinity-focus camera, thereby said infinity-focus camera captures the direct view of the human eye.

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